Making Frozen Delicacies at Home

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AT A TIME when the market price for whole milk and butterfat is low in comparison with the prices of other food commodities, farmers will find it particularly advantageous to consume as much of their own dairy products as practical. Altho most farm families use milk and cream extensively for the table, in cooking, and in the making of butter and cheese, only minor consideration is usually given to their use in the making of frozen delicacies.

Nutritious, attractive, inexpensive, and convenient to serve, ice cream deserves the great popularity it has in the American menu. It is suited to any occasion at any season. Containing fat, carbohydrate, protein, mineral matter, and vitamins, it is an excellent food for promoting growth and supplying energy. It has long been recognized as a good food for children and invalids as well as for normally healthy adults.

Sherbets and ices, while not so high in food value as ice cream, are also excellent foods and contain some growth-promoting and energy-producing substances. Flavored with true fruit, they supply appreciable amounts of vitamin C, the anti-scorbutic vitamin. The milk solids in sherbets give them higher food value than the ices, which are made of water, fruit juices, and sugar. Both ices and sherbets, however, are especially good hot-weather dishes because of the large amounts of frozen water they contain.

AN ICE-CREAM CAKE

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By P. H. Tracy, Associate Chief in Dairy Manufactures

INGREDIENTS USED IN ICE CREAM

In making ice cream, the ingredients ordinarily used are milk products, sugar, a flavoring material, a binder, sometimes a filler, and coloring matter.

Milk products—cream, whole milk, evaporated or condensed milk, or a mixture of these—used in ice cream, give it its richness, smoothness, and resistance.

The most practical milk products to use in making ice cream at home are cream, milk, and condensed milk. Condensed milk that has been heated to a high temperature should be used only in small proportions or the finished product will have a cooked flavor.

Sugar increases the palatability of ice cream. Either cane, beet, or corn sugar or honey can be used. Cane and beet sugar are identical chemically and are of equal value in ice-cream making. Corn sugar, however, is not so sweet as cane or beet sugar and must therefore be used in greater proportions to obtain the same sweetness. One and one-half cups of corn sugar about equal 1 cup of cane or beet sugar from a sweetening standpoint. Since corn sugar lowers the freezing point of the mixture to which it is added to a greater extent than cane or beet sugar, thus making it more difficult to freeze the ice cream, it is advisable to replace only one-fourth to one-third of the cane or beet sugar with corn sugar.

Extracted honey can be used satisfactorily to replace 50 to 100 percent of the sugar in an ice-cream mix, and in these proportions gives so distinct a flavor to the ice cream that a new and pleasing variety is obtained. Since honey is not so sweet as sugar, it must be used in greater proportions. One and one-third pounds of honey about equal 1 pound of cane or beet sugar in sweetness. However, the specific gravity of honey being so much greater than that of sugar (1 gallon of strained honey weighs 12 pounds) it requires only slightly over $\frac{4}{5}$ cup of honey to supply the sweetness in a cup of cane or beet sugar.

Flavors may be either true, artificial, or imitation. For example, vanillin, the flavoring principle of pure vanilla extract, is derived from vanilla beans, such as the Mexican or Bourbon beans; artificial vanilla flavor is prepared from synthetic vanillin; while the flavoring principle

of imitation vanilla is coumarin, a substance that has a flavor slightly resembling that of vanillin. In practically all cases the true flavor is to be preferred, particularly if the fruit or its juice is available.

A *binder,* such as gelatin, the one ordinarily used, prevents the formation of large ice crystals when the ice cream hardens, and thus adds to its smoothness. Gelatin also makes the ice cream less watery when it melts.

Eggs are the most common *filler,* altho starch and flour are occasionally used, as they furnish smoothness at a nominal cost.

Harmless food *coloring* is sometimes added to increase the attractiveness of the ice cream when served. Either powdered or liquid food color can be secured for coloring the mix. Such colors do not injure the flavor of the ice cream if added in reasonable amounts. Ordinarily, green, red, yellow, pink, and orange shades will supply sufficient variety.

STEPS IN PREPARING ICE-CREAM MIX

Pasteurizing the Mix

The unfrozen ice cream (called the "mix") may or may not be cooked. If unpasteurized milk products are used, it is safer from a health standpoint to pasteurize the entire mix by heating it to 145-150° F., to hold it at that temperature for 30 minutes, and then cool it rapidly to at least 60° F. For pasteurizing it is advisable to use a double boiler in order to avoid imparting a scorched flavor to the ice cream. The temperature should be checked by an accurate dairy thermometer, which can be secured from any hardware dealer.

Addition of Gelatin

If gelatin is to be used, dissolve it in about eight times its weight of cold water and then heat to 145° F. Be careful not to heat much higher than this, for if heated too high, its jellying strength will be impaired. If the mix is pasteurized, the gelatin solution can be added to the hot mix without difficulty. When the gelatin solution is added to a cold mix, however, it should be poured into it in a fine stream, and the mix stirred rapidly at the same time to prevent the formation of lumps or threads of gelatin.

Addition of Eggs

When using eggs, separate the yolks from the whites and combine the yolks with the other ingredients if the mix is to be pasteurized; otherwise, mix the yolks with a small portion of the cream and cook

over a slow flame to a custard-like consistency, stirring frequently. The whites should be beaten and added to the cooled mix just before freezing. Two eggs to ½ gallon of mix is ordinarily sufficient.

Aging the Mix

For the best results, a mix made of fresh products, and especially one that has been heated, should be held for at least three hours at a

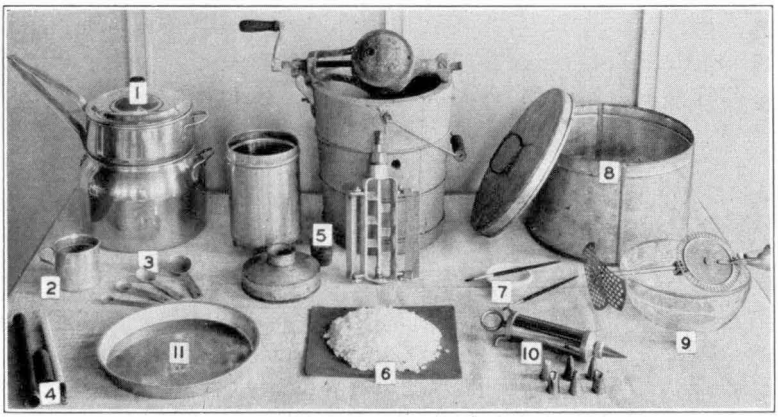

FIG. 1.—SOME EQUIPMENT USED IN MAKING ICE CREAM AT HOME

(1) Double boiler for pasteurizing mix or heating gelatin solutions, (2) measuring cup, (3) measuring spoons, (4) thermometer, (5) parts of 2-quart freezer, (6) coarse salt, (7) brushes used for decorating fancy ice cream, (8) tin container for packing ice-cream pies and cakes, (9) cream whipper, (10) pastry tube (icing set), (11) pan used for making ice-cream pies and cakes.

low temperature before being frozen. It is a good practice to prepare the mix the day before it is to be used. This will result in a smoother ice cream and will increase the yield.

Adding Flavoring and Coloring

Add flavoring extracts and coloring just before freezing. If whole fruit is used, it should be crushed, reduced to a sirupy mixture with sufficient sugar to suit the taste, and added after the ice cream is frozen. Fruit that is left whole becomes hard and icy when frozen and does not properly flavor the ice cream.

FREEZING THE MIX

Ice-cream freezing is a chilling process whereby sufficient heat is removed from the mix to reduce it to a temperature that will permit

the incorporation of the desired amount of air. The temperature at which ice cream freezes depends on the kind and amount of solids present. The more skim milk solids and sugar used, the lower will be the freezing point of the mix. There is also a difference in the way sugars affect the freezing point. For example, when corn sugar, invert sugar, or honey is used, the ice cream will freeze at a lower temperature than it would if the same weight of cane or beet sugar had been added. The freezing point of most mixes will lie within a range of 26°-28° F.

In freezing ice cream, heat is removed by conduction thru the metal container to the brine. The rapidity of heat transfer will depend, to some extent, upon the speed of the dasher, the completeness of the scraping action of the dasher, and the temperature of the brine. The dasher must travel fast enough to keep the ice cream from freezing to the side of the can. It is also important that the dasher be properly centered so that the scraper will make complete contact with the freezer can as it is rotated.

The temperature of the brine is related to the proportion of salt to ice and the rapidity with which the ice melts. The faster heat is supplied from the outside and the finer the ice and salt, the faster the ice will melt. The importance of a low-temperature brine to insure rapid freezing is shown by the following figures:

Ratio of salt to ice, by weight	Brine temperature	Minutes to freeze
1 : 14	14° F.	14
1 : 12	13° F.	9
1 : 10	**12° F.**	**8**
1 : 8	**10° F.**	**7**

For best results, use a pound of coarse salt to every 8 or 10 pounds of fine ice. The ice and salt may be mixed before adding to the freezer or at the time they are added to the freezer. If the latter method is used, it is advisable to add most of the salt in the upper half of the ice. Only enough of the brine formed should be removed to prevent the level reaching the lid. If the brine drain is placed just below this point, there will be no danger of the brine working into the ice cream, provided the drain is kept open.

During the freezing process a certain amount of air is incorporated. Commercially, this is termed "swell" or overrun. An overrun of 100 percent would mean that the volume of the finished ice cream was twice that of the unfrozen mix. The amount of "swell" obtained on homemade ice cream usually does not exceed 50 to 60 percent. A certain amount of "swell" is desirable, especially with rich ice creams, as

too little overrun may result in a heavy, soggy product. Aging the mix before freezing, the addition of eggs, and the use of evaporated (unsweetened condensed[1]) milk will assist in getting the desired overrun. Fill the freezer can not over two-thirds full, so as to allow room for the mix to swell as it freezes.

The freezer handle may be turned slowly until the ice cream begins to freeze; then the speed should be increased in order to secure the desired overrun before the ice cream becomes too stiff. Ice cream is properly frozen when it has the consistency of hot corn-meal mush. It is important to neither overfreeze nor underfreeze it.

In order to allow sufficient time for hardening, it is advisable to complete the freezing at least three hours before the ice cream is to be served.

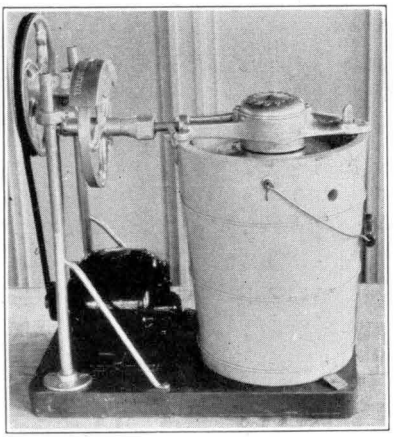

FIG. 2.—POWER-OPERATED ICE-CREAM FREEZER

PACKING THE ICE CREAM

To pack the ice cream, remove the dasher from the freezer, firm the ice cream in the can, plug the opening in the lid with a large cork, drain the brine from the tub, and add more salt and ice. The ice particles need not be so small nor will as much salt be needed as when freezing. It is best to fill the tub about half full of ice, and then add a layer of salt, then enough ice to finish filling the tub, and lastly another layer of salt. One pound of salt to 15 pounds of ice will be sufficient. Either leave the brine drain open or drain the brine occasionally so as to avoid getting brine in the ice cream. Cover the tub with dry newspapers or sacks until the ice cream is needed. It may be necessary to repack after 2 to 3 hours.

TYPES OF FREEZERS

The salt and ice-tub freezer is the one most commonly used on the farm. It is available in sizes ranging from two to twenty quarts. These freezers may be operated either by hand or by mechanical power (Fig. 2). In equipping a tub freezer with a motor drive, the pulley

[1]See formula 2, page 9.

and gear ratio should be such that the freezer can will revolve at a speed of 90 to 100 revolutions a minute.

Vacuum freezers are sometimes used. These freezers are insulated containers without any mechanical provision for agitating the mix during freezing. The agitation necessary to incorporate the air and facilitate the freezing can be supplied by occasionally stirring the contents of the freezer can with a knife or spoon.

There are some kitchen-size mechanical cream whippers and bread mixers on the market that have the necessary attachments for operating a small tub ice-cream freezer.

The question may arise as to the use of the mechanical household refrigerator for freezing ice cream. The freezing chambers of these refrigerators provide low enough temperatures to maintain the ice cream after it is frozen, but they are not suited for freezing products that must be whipped as they are frozen. A mousse, for example, which is frozen whipped cream, can be very easily prepared in the mechanical refrigerator, for the whipping can be done before the refrigeration is applied, but ordinary ice cream cannot be so prepared.

TABLE OF EQUIVALENTS AND ABBREVIATIONS

Any of the formulas given in this circular can be increased or decreased to suit immediate needs. Care should be taken, however, to weigh or measure the amounts accurately. The following table may be of help in this respect:

16 ounces (oz) = 1 pound (lb)
3 teaspoons (t) = 1 tablespoon (Tb)
16 tablespoons (Tb) = 1 measuring cup (c)
2 cups (c) liquid = 1 pint (pt)
2 pints (pt) = 1 quart (qt)
4 quarts (qt) = 1 gallon (gal)
2 tablespoons (Tb) liquid = 1 ounce (oz)
2 cups (c) sugar (packed by tapping) = 1 pound (lb)
1 pint (pt) whole milk = 1.07 pounds (lb)
1 pint (pt) light cream (22% fat) = 1.05 pounds (lb)
1 pint (pt) heavy cream (40% fat) = 1.03 pounds (lb)
1 pint (pt) evaporated milk = 1.11 pounds (lb)
1 pint (pt) sweetened condensed whole milk = 1.35 pounds (lb)
1 ounce (oz) gelatin = 4½ level tablespoons (Tb)

All measurements are level.

ICE-CREAM FORMULAS

For plain vanilla ice cream the following formulas are suggested. They will make about 5 pounds of unfrozen ice cream, or a little over ½ gallon. When frozen, there should be between 3 and 4 quarts of ice cream, depending upon the amount of air incorporated. *Study the steps in making ice cream given above before using formulas.*

Formula 1

(Plain vanilla using coffee cream)

2 qt coffee cream (18-22% fat)
¾ lb (1½ c) sugar
1 Tb high-grade gelatin dissolved in ½ c cold water
1 Tb vanilla

Dissolve gelatin in water, and heat mixture to about 145° F. for 15 minutes. Do not heat too high or the strength of the gelatin will be reduced. Mix cream and sugar. Add gelatin mixture in fine stream, stirring constantly. Add vanilla.

Formula 2

(Plain vanilla using coffee cream and evaporated milk[1])

1¾ qt coffee cream
½ pt evaporated milk
¾ lb (1½ c) sugar
1 Tb gelatin dissolved in ½ c cold water
1 Tb vanilla

Use directions given for Formula 1.

Formula 3

(Plain vanilla using coffee cream and sweetened condensed whole milk[2])

1¾ qt coffee cream
½ pt sweetened condensed milk
½ lb (1 c) sugar
½ c whole or skim milk
1 Tb gelatin dissolved in ½ c cold water
1 Tb vanilla

Use directions given for Formula 1.

Variations of Standard Formulas

Many varieties of ice cream are possible because of the large num-

[1]Evaporated milk contains about 8 percent butterfat and 18 percent skim milk solids. In the process of manufacture the milk is passed thru a high pressure machine, called a homogenizer, or viscolizer, which causes the fat globules to be greatly reduced in size. Consequently by replacing some of the cream with evaporated milk, a better whipping mix is secured and a smoother ice cream results.

[2]Sweetened condensed whole milk usually contains about 8 percent fat, 20 percent skim milk solids, and 42 to 44 percent added cane or beet sugar.

ber of flavors that may be substituted in or added to the formulas for plain vanilla ice cream.

Fruits, confections, and nuts are commonly used. If fresh fruit is used, it should be mixed with sugar before it is added to the ice cream. For such fruit as strawberries, one part of sugar to two parts of fruit will be sufficient. About 15 percent fruit is necessary to secure the proper flavor.

Bisque ice cream can be made with candies, such as mint stick, English toffee, chocolate chip, and marshmallows. Grapenuts, macaroons, and ladyfingers are used in the same way. In making bisque ice cream, add about 5 ounces of the candies and cakes for each 5 pounds of mix. Break into small particles and mix with the frozen ice cream.

Nuts can be used alone or in conjunction with such other flavors as fruit, caramel, maple, or chocolate. Walnuts, pecans, and pistachio nuts added at the rate of 2 ounces to each gallon of the ice cream will impart very desirable flavors.

Coffee ice cream is made by adding sufficient strong coffee to the mix to give the desired flavor.

A very delicious ice cream can be made by replacing the ¾ pound of sugar in Formula 1 with 1 pound (⅔ pt) of strained honey. Vanilla extract should not be used with honey, as these flavors do not blend well; however, some fruits and confections, crushed pineapple and grapenuts for example, can be used in honey ice cream to advantage.

Chocolate is one of the most popular of all ice creams. It can be made with either cocoa or chocolate. Cake chocolate contains more of the cocoa fat than cocoa, and is therefore not so strong in chocolate flavor. Consequently about 50 percent more chocolate than cocoa is needed to produce the same amount of chocolate flavor.

Chocolate Sirup Formula[1]

1⅓ lb cocoa
2 lb sugar
2 qt water

Mix cocoa, sugar, and enough water to make a paste. Continue adding water slowly to avoid lumps. Heat to 175° F. and hold at that temperature for 15 to 20 minutes. Cool. Use ¾ pound of this sirup with Formulas 1, 2, or 3.

[1]This sirup can be used also in the preparation of chocolate milk drinks. One gallon of such a product can be prepared by mixing together:

¾ lb sirup
2 qt whole milk
Enough skim milk to make 1 gallon
2 Tb vanilla
Pinch of salt

ICES AND SHERBETS

A water ice is a frozen mixture of water, sugar, lemon juice, or citric acid, and various fruit flavors. A binder, such as gelatin, may be added to improve the body of the product. Imitation fruit flavors may be used, but to obtain the highest quality of product the true fruit or its juice is preferable.

Water Ice Formula

(1 gallon)

2 lb (4 c) sugar
Juice of 6 lemons
4 lb (8 c) water
1½ Tb gelatin dissolved in ½ c cold water

With the above formula as a base, many flavored ices, such as pineapple, cider, apricot, cherry, grape, cranberry, or mint, may be made. When fruit juice is used to give flavor, the amount of water called for must be reduced by the amount of fruit juice added.

Sherbet Formula

The same formula given for water ice is used for sherbets except that milk is substituted for the water. The lemon juice should be added slowly to the partly frozen milk mixture in order to avoid curdling.

The freezing point of ices and sherbets is lower than that of ice cream. It is therefore important that these products be well packed if they are to be properly hardened. It may be necessary to repack occasionally.

LACTO[1]

Lacto is somewhat similar to sherbet except that it is made from starter or buttermilk. When properly made it has an excellent flavor and should prove very popular as a summer food. The following proportions will make 1 gallon of lacto.

2 qt good starter or buttermilk
2 lb (4 c) sugar
3 beaten eggs
½ pt grape juice (or any other fruit juice desired)
Juice of 3 lemons

Mix ingredients in the order given above and freeze in the same way as sherbets.

[1]More detailed information on the making of lacto is given in Iowa Agr. Col. Bul. 140, *Lacto: a frozen dairy product,* by Mortensen, M. and Hammer, B. W. 1913.

FRAPPE

A delightful drink for summer can be prepared as follows:

Juice of 6 lemons
Juice of 4 oranges
½ pt grape juice (or raspberry or loganberry)
1 lb (2 c) sugar
2 drops mint extract
Enough water to make 1 gallon

To get the proper blend of flavors, this mixture should be held at a low temperature in a glass container for about 24 hours before serving. It may be served in either a fluid or a semifrozen state.

ICE CREAMS FROZEN WITHOUT STIRRING

Ordinary ice creams, ices, and sherbets must be whipped as they are frozen in order to incorporate air. There are a few desserts, however, that may be frozen after they are whipped by packing in salt and ice or by placing in the freezing chamber of a mechanical refrigerator. Mousse and frozen fruit salad are examples of delicacies that can be prepared in this way. These products may be hardened in special molds, or in tin or paper containers that can be tightly sealed. If placed in salt and ice for hardening, crush the ice rather fine and add salt at the rate of 1 pound for each 6 pounds of ice. About 3 hours should be allowed for hardening.

The rapidity of hardening in the mechanical refrigerator will depend on the temperature for which the machine is set. It also should be remembered that the more fruit and sugar the mixture contains, the longer it will take to harden. Usually special trays are provided with the refrigerator that can be used for hardening whipped desserts.

Frozen Fruit Salad

Frozen fruit salad consists of a mixture of whipped cream, sweetened mayonnaise, and fruit placed in containers and hardened. The following amounts of ingredients will make 2 quarts of salad:

⅘ pt mayonnaise
½ pt (1 c) sugar
1 qt whipped cream
⅘ qt mixed fruit

Chill whipped cream. Add sugar and enough mayonnaise to suit individual taste. Add fresh or canned whole fruit, such as pears, peaches, apricots, white and red cherries, and colored pineapple cubes or slices, in generous amounts to whipped cream and mayonnaise mixture. Place mixture in a tight container if the freezing is to be done in salt and ice. Tight paper containers are satisfactory for this purpose, or a tin can with a tight-fitting lid may be used. When frozen, remove from containers and serve on lettuce with mayonnaise.

Mousse

To make a gallon of mousse use the following proportions:

2 qt whipping cream (33-35% fat)	1½ Tb gelatin dissolved in ½ c cold water
¾ lb sugar	Fruits and flavors as desired
1 Tb vanilla	

Whip cream. Add sugar and vanilla, then fruit and flavors. Gelatin added to the unwhipped cream, as explained for the ice-cream recipes, will improve the body of the mousse. Mousse is not frozen in a freezer, but is hardened in the same way as frozen fruit salad. Other flavors, such as chocolate, mint, pineapple, strawberry, peach, cherry, or burnt almond, may be used for variety.

FANCY ICE CREAM

With very simple equipment the housewife can prepare various molds and make ice-cream "pies" and ice-cream "cakes" for serving at a fancy dinner or party.

Center Molds

Center-mold ice cream can be made with equipment such as shown in Fig. 3. In using molds of the type represented by the turkey, witch, and stork, fill the can, which may be either rectangular or cylindrical

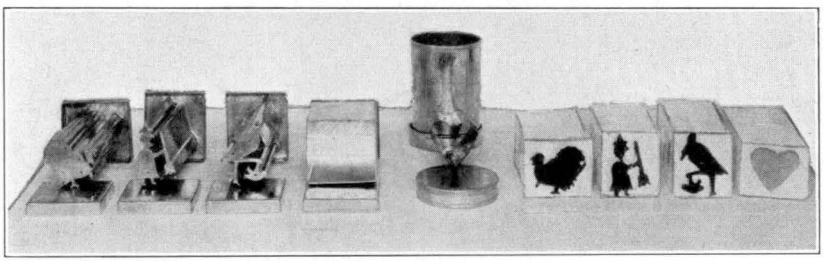

FIG. 3.—CENTER MOLDS AND CENTER-MOLD BRICKS

in shape, three-fourths full of the desired color of firm ice cream. Push the metal mold thru the ice cream. This will cause the excess ice cream to ooze out the top. Then pour warm water into the mold, pour the water out immediately, and withdraw the mold from the ice cream. Fill the place left by the mold with ice cream of the consistency of thick sirup. Place the cover on the can and submerge in ice and salt for hardening.

The heart center represents another type of center mold. To make this design, fill the metal mold with soft ice cream; remove the ice-

cream mold after hardening and place in a rectangular or cylindrically shaped container filled about two-thirds full of fairly firm ice cream. Add more ice cream if necessary to fill the container completely, cover, and bury in ice and salt for hardening. This requires at least two hours.

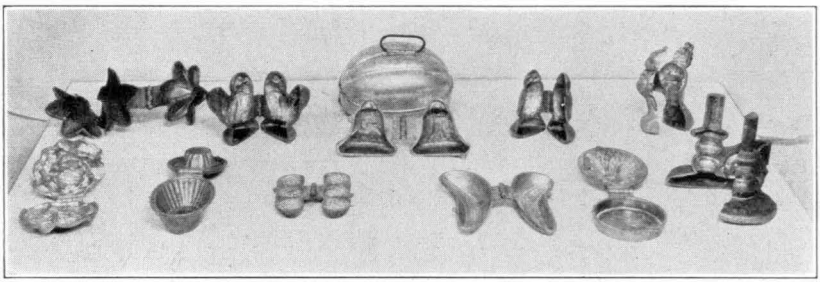

FIG. 4.—INDIVIDUAL MOLDS FOR FANCY ICE CREAM

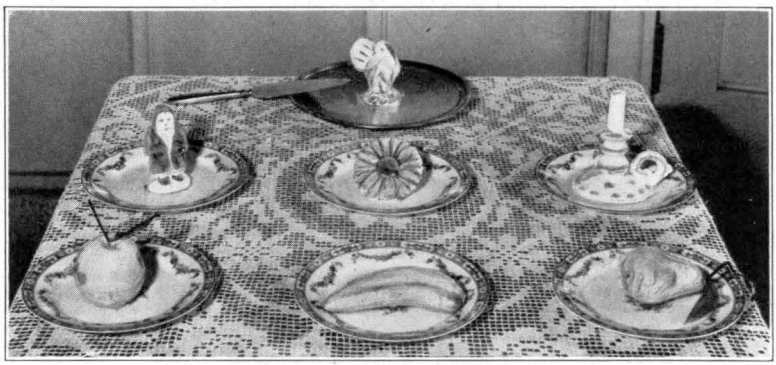

FIG. 5.—ICE CREAM FROZEN IN INDIVIDUAL MOLDS

In making center molds various color combinations can be obtained by making the center of one color and the remainder of the brick of another color. Harmless food colors can be used to color the ice cream either before or after it is frozen.

Individual Molds

To make individual ice-cream molds use metal molds of the desired pattern. Fill the molds with enough ice cream in the plastic state so that when the molds are closed the excess ice cream will be forced out between the edges of the mold, preventing the ice cream from getting a salty flavor. Bury in ice and salt until properly hardened. This re-

quires about an hour. Then submerge the molds in warm water for a few seconds. This permits the ice cream to be removed easily. Ordinarily molds are decorated by the use of a dilute water solution of food color, which is applied with a coarse brush. Wax-paper leaves and twigs can be used to make fruit molds look more natural.

Ice-Cream Pie

For the crust of an ice-cream pie, line a new pie pan with vanilla ice cream colored light brown. Allow it to harden, and add a layer of fruit, such as fresh strawberries (sweetened), or a layer of flavored

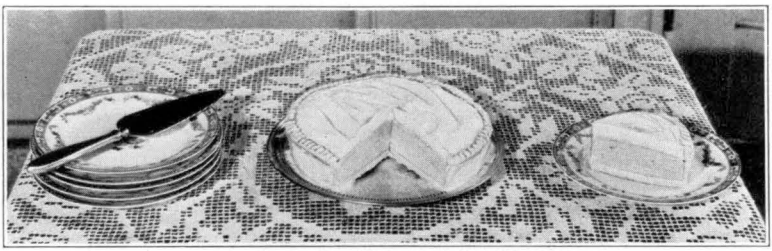

FIG. 6.—AN ICE-CREAM PIE

ice cream, such as chocolate. After hardening, dip the pan in lukewarm water to remove the pie. Cover with sweetened whipped cream and again harden.

Ice-Cream Cake

Using cake pans of proper size, prepare the number of layers of ice cream desired. Different flavors may be used. Harden and stack the layers one on top of the other with a thin layer of sweetened whipped cream between. Cover all with whipped cream. Using a pastry tube, decorate the top of the cake with colored whipped cream. This work should be done in a cool room.

Hardening Pies and Cakes

Ice-cream pies and cakes may be hardened by placing them—pan and all—inside of a slightly larger closed pan, such as a marshmallow box, which in turn should be buried in ice and salt in a wooden tub. A brine drain near the top of tub should be provided so that brine does not leak thru to the ice cream. Where available, the freezing chamber of a mechanical household refrigerator may be used for hardening fancy ice cream, provided temperatures as low as 8° F. can be obtained.

Important Points in Freezing Ice Cream

1. Freeze at least 3 hours before the ice cream is to be served.
2. Be sure dasher is properly centered.
3. Fill freezer can not over two-thirds full.
4. Add liquid flavors before freezing. Add fruits and confections after freezing. Fruits should always be mixed with sugar before adding to the ice cream.
5. Crush ice into fine particles.
6. Use coarse salt and add at rate of 1 pound to 8 to 10 pounds of ice.
7. Remove only enough of brine to prevent level from reaching can lid. The brine is necessary in order to freeze the ice cream rapidly.
8. Turn handle slowly until mix begins to freeze and then increase speed.
9. Do not underfreeze or overfreeze. Ice cream is ready to pack when it has the consistency of hot corn-meal mush.
10. Firm the ice cream in the can; cover and pack with ice and salt at rate of 1 pound of salt to 15 pounds of ice.
11. Cover freezer with papers or blanket, and store in cool place.